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# A Comparison of Native and Foreign-Born Mexican American Dietary Patterns

**Abstract**:

Data comparing diet quality of US-born and Mexico-born MA is limited in quantity and available data is largely outdated. This study aims to provide up-to-date information on the dietary quality of US- and Mexico-Born MA. NHANES 2005-2010 data was analyzed to evaluate dietary quality via HEI score and nutrient composition of MA meeting inclusion criteria, with Mexico or the US as their country-of-origin (n=3194). Dietary quality of the collective MA population was analyzed, in addition to a comparison of US-born (n=1,345) and Mexico-born (n=1849) subgroups. Mexico-born MA were found to have a diet of greater quality than US-born MA (HEI: Mex-48.0, US-45.4). Both groups consumed inadequate vitamin A and magnesium and US-born consumed significantly less magnesium (P=0.003), potassium (p=0.029), vitamin C (P=<0.001), but consumed greater amounts of folate (P=0.044). Research implications include the provision of early interventions to support retention of positive dietary qualities and the prevention of those negative.

Keywords: acculturation, diet, emigration and immigration, food habits, health behavior, Mexican Americans, micronutrients, socioeconomic factors

The Hispanic population is the largest ethnic minority in The United States, with the Mexican American (MA) population as the largest subgroup .[1] The U.S. Census Bureau projects that the Hispanic population will achieve over 25% of the US population by the year 2060.[1] If the MA population grows at a similar rate, this would put the total MA population at approximately 16% of the total U.S. population. The magnitude and growth rate of the MA population has created considerable interest in the health and well-being of this group, which faces many disparities in comparison to the general U.S. population. Poor nutritional habits lead to poorer health outcomes and the decreased vitality of a nation—as healthcare spending continues to grow, it becomes increasingly imperative that action is taken to reduce and reverse this trend.

Previous research has indicated poorer nutritional status in MA compared to the Caucasian population, as well as differences between MA born within the U.S. and those native to Mexico.[2,3] Various complex factors puts the Mexican American population at risk of inadequate dietary quality: from the financial and community resources to which one has access, to nutrition-related knowledge and food preferences.

One of the major causes of health discrepancies in the MA population can be traced back to financial disparities: In 2014, it was found Mexican Americans are living in poverty at a much greater rate than the general population—25.6%, compared to the U.S. average of 14.8%.[4,5] With decreased income comes an increase in food insecurity due to its direct effect on the ability to purchase nutritious food, decreased access to food, and decreased educational level and

subsequent deficits in nutrition-related knowledge—cumulatively leading to a decreased intake of healthy foods.[6]

In particular, Mexico-born AM face even greater health discrepancies than those born in the US. Primary health disparities in the MA population consist of obesity and diabetes, two conditions highly influenced by dietary intake patterns.[7] Of particular interest to this study, obesity and hypertension have also been found to impact foreign-born MA at a higher rate than those born in the United States.[7]

Multiple etiologies contribute to these varying outcomes: Mexico-Born MA have been subject to less financial prosperity, with those born outside the United States having a weekly income at 80% of their counterparts.[8] In competition with this, differences in dietary patterns have been found in individuals with a greater level of acculturation, primarily measured by familial generation in the United States. With each succeeding generation it was found that dietary quality decreased, as assessed by the Healthy Eating index. [2]

There has been inadequate data on the factors leading to the health outcomes seen in today's Mexican American population, with an especially notable knowledge gap surrounding varying dietary patterns and nutrient density of MA subgroups. The purpose of this study is to determine the dietary patterns, nutrient content, and overall dietary quality of MA and to recognize discrepancies between those born within the U.S. and those born in Mexico. Our study allows for a better understanding of MA diet quality as a whole as well as differences

between US- and Mexico-born MA to facilitate the development of increasingly effective interventions that limit the barriers to high-quality dietary patterns.

## Methods

The dietary intakes of MA living in the United States that were 18 years of age or older, non-pregnant, and non-institutionalized (n=3508) were analyzed to determine inadequacies and discrepancies concerning dietary quality. This study also excluded Mexicans that were not born in Mexico to limit the impact that other cultures may have on the sample. The analyzed data was obtained through the results of three cycles of the National Health and Nutrition Examination Study (NHANES), taking place from 2005 to 2010.

NHANES is a national study, established by the National Center for Health Statistics of the Center for Disease Control, which carries out in-person interviews and physical examinations of subjects.[9] Steps are taken to ensure that groups of particular interest are adequately represented via the process of oversampling, which increases the likelihood that members of these groups will be sampled. Individuals are not selected using simple random sampling methods; rather, a complex, multistage, probability-sampling design for selecting non-institutionalized U.S. civilians is used. NHANES data collection takes place on an ongoing basis, published in biennial cycles. Demographic information is gathered through in-home interviews, where as physical examinations and the dietary intake interview take place within specially designed mobile facilities. All members of the NHANES team that carry out data collection are skilled

professionals; this team consists of: a physician, a dentist, medical and health technicians, and health interviewers. As data were released as deidentified public use datasets, no IRB approval is required.

**Classification of origin**. Data collected during the interview is related to health conditions, risk factors for conditions, and health behaviors, such as dietary intake, which will provide the information to be used in this study. Dietary data is collected through a 24-hour recall utilizing the USDA Automated Multiple Pass Approach. Nutrient and MyPlate equivalent intakes obtained from foods reported during the recall were estimated using the Food and Nutrient Database for Dietary Studies (FNDDS) and the Food Patterns Equivalents Database (FPED), respectively. The food and nutrient database for dietary studies is a collection of over 7,600 main food/beverage descriptions and 9,900 additional food/beverage descriptions. The database provides a unique 8-digit food code to facilitate tabulation.

**Data Preparation**. Data were analyzed in this study concerning the quantity of foods groups/subgroups and beverages consumed by individuals daily, as well as the nutritional composition of those foods, to aid in determination of overall dietary quality of MA as well as differences between those native and foreign-born. The nutritional components examined consist of the total kcal, grams of protein, fat, and carbohydrates, and kcal from solid fats, added sugar, and from alcohol. Micronutrients analyzed included iron, sodium, potassium, magnesium,

and vitamins A, B6, B12, C, and folate. All nutrients were analyzed as the amount of the nutrient per every 1000 kcal consumed to account for differences in energy intakes. To assess differences in overall diet quality, data from FNDDS and FPED were used to compute the Healthy Eating Index-2010 (HEI-2010), which is a numeric reflection of concordance with the 2010 Dietary Guidelines for Americans.[10]

The foods groups/subgroups that determine the total HEI score consist of: total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein food, seafood and plant proteins, fatty acids, refined grains, sodium, and empty calories. The total HEI-2010 score ranges from 0 to 100, with a greater amount of points representing higher dietary quality and with dietary quality still represented as accordance with the 2010 Dietary Guidelines for Americans [Table-1].

**Statistical Analysis**. Public-use data were available for download from the NHANES website, allowing for the comparison of dietary measures of total nutrient intakes and HEI scores between native and foreign-born Mexican Americans. Tabulation of data was conducted using the SPSS Complex Samples (v22, IBM SPSS Inc) to produce population-based means as well as standard errors that reflect the sample size. Descriptive statistics, including mean and standard error of the mean, were used to summarize intakes of nutrients and HEI scores of groups. Analysis of data was performed using the independent

samples t-test to determine statistical significance, with a priori significance level of $P<0.05$.

## Results

NHANES data was collected on n=3495 Mexican Americans that met the inclusion criteria: however, 301 individuals were excluded based on missing or incomplete dietary recall data. The total sample used in this study, including individuals both native and foreign-born, was n=3194. Of this sample, 57.9% (n=1849) were born in Mexico and 42.1% (n=1345) were native to the United States. The present study only included MA with Mexico or the United States as their country of birth.

Several statistically significant differences in dietary intakes existed between in Mexican Americans that were born in the US compared to Mexico. Regarding nutrient intake, those Mexico-born were more likely to have a diet lower in total fat (72.6 vs. 83.4 g, P=<0.001) and energy from solid fats (316.3 vs 396.2 kcal, P=<0.001), while they also consumed significantly more potassium (2753.8 vs. 2591.1 mg, P= 0.029), magnesium (321.1 vs. 295.0 mg, P=0.003) and vitamin C (106.2 vs. 83. 9 mg, P=<0.001). However, US-born MA were significantly more likely to have diets higher in folate (534.9 vs. 500.5 mcg, P=0.044), [Table-2]. Significance was retained for these nutrients when intake was energy-adjusted to intake per 1000 kcal, and two nutrients became significant: carbohydrate (US: 123.43 vs. Mex: 132.97g, P= <0.001) and iron (US: 7.51 vs. Mex: 7.16 mg, P=0.045) [Table-3].

An analysis of HEI scores also revealed discrepancies between the two groups. Foreign-born MA had significantly better HEI-2010 scores for total fruit (2.5 vs 1.9, P=<0.001), whole fruit (2.4 vs. 1.7, P=<0.001), greens and beans (2.0 vs. 1.4, P=<0.001), sodium (5.9 vs. 4.4, P=<0.001), empty calories (11.2 vs. 9.9, P=<0.001), and overall diet quality (total HEI-2010 score: 48.0 vs 45.4, P=0.001). In contrast, those native to the United States were found to consume more whole grains (1.9 vs 1.2, P=<0.001) and less refined grains (5.2 vs 3.5, P=<0.001), [Table-4].

## Discussion

The present study indicates that there are significant discrepancies between the intakes of Mexican American native to the United States and those born in Mexico, as well as deficiencies and excesses common to both groups. Overall, it can be seen that Mexico-born MA do have a higher dietary quality compared to those born in the US—stemming from greater intake of fruit and whole fruit, vegetables, greens and beans, and lesser amounts of sodium and kcals from fat. This corroborates prior studies that have shown decreases in dietary quality with each proceeding generation of MA, resulting in lower HEI scores.[11]

Previous studies have also shown a higher rate of cardiovascular disease in US-born MA and increased intake of fat and sodium as well as other nutritional excesses/inadequacies are potential contributing factors.[10] Early interventions that promote the moderation of total fat and sodium intake to appropriate levels

and incorporation of adequate unsaturated fat may help reduce the risk of cardiovascular disease, obesity, and diabetes.

Nonetheless, there are still benefits of the diet held by US-born MA, as seen in their higher intake of high-fiber whole grains and lesser intake of refined grains, contributing to a greater folate intake, as well as iron intake after energy-adjustment. Although the mean folate intake is also above the RDA for both groups, the RDA for folate increases significantly during pregnancy—the MA population is subject to a greater rate of neural tube defects and this complicated topic requires more thorough and up-to-date research.[12]

Additionally, vitamin A, magnesium, and calcium were found to be below the RDA in both groups [Table-5]. Promotion of nutrient-dense foods should continue to be promoted in education sessions, however, it is equally important that financial barriers be addressed, as many of these products can be relatively expensive.

Overall diet quality is best visualized through the HEI scores of the MA groups: both the foreign-born (HEI-48) and US-born (HEI-45.4), are below the 51-point marker and would therefore be labeled as diets of poor quality and below the HEI score of 51.6 found for the general American population.[9] As modest as they appear, these disparities becomes increasingly notable in the face of a greater prevalence of nutrition-related health conditions that also exists in this population.[7]

One of the most prominent findings of the HEI analysis was the difference in whole fruit intake between groups—U.S. born MA consumed 71% of the intake

of whole fruit as their counterparts, yet the Mexico-born group still consumed just half the recommended intake. These discrepancies between MA groups and between MA and the general population can be tied back to the various factors that are often insufficient in MA and other minority populations.

Though financial status is a important factor that is often limited for MAs, the Mexico-Born group is still achieving higher diet quality with lesser income—yet we are not seeing this manifest as greater health status: It is important to examine the full-scope of factors relating to both dietary patterns and health outcomes.[7]

The Socio-Ecological Model provides an accurate lens for the viewing the numerous etiologies of dietary/health disparities in the MA population. This model accounts for the broad scope of environmental factors that ultimately influence individuals and their health outcomes by looking at intrapersonal, interpersonal, organizational, community, and policy-related factors—all of which are very interrelated and demand attention [Table-6]. [13]

Limitations of this study include only one day of dietary recalls being analyzed by NHANES and that this may or may not represent a typical day of intake for an individual. However, with a large sample, such as that used in the present study, this effect should be dispersed between groups. Additionally, vitamin D intake was not measured in this study, due to missing data regarding intake of this nutrient. Lastly, there is a large annual migration of Mexico-born MA to the US for temporary farming employment. The number of these individuals

included in the NHANES sample is unknown and the effect on the data is hard to determine, as they would have strong traditional Mexican eating patterns, but are also very limited in finances and other resources.

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## Conclusions

This study has corroborated previous findings regarding Mexican American dietary quality as a whole and contributed to the developing literature regarding discrepancies between native and US-born MA populations. The quality of the Mexico-born group was found to be of marginally lesser quality than their counterparts, largely due to a greater intake of fruit, lesser fat, and sodium intake by foreign-born MA. In addition to the promotion of whole fruits in both groups, promotion of vegetables—especially those high in vitamin A—low-fat dairy, and whole grains needs to be carried out.

Nutritional inadequacy is a widespread issue throughout the US and a major perpetuator of this inadequacy is related to financial strain and subsequent food insecurity, limited food availability, preferences/knowledge deficits, and various environmental factors; these characteristics are more prevalent in minority populations.[8,14] This multifactorial cause of poor dietary quality needs to be addressed with an equally complex multifaceted response that addresses as many of these etiologies as possible. Studies specific to MA populations that measure the impact of multifactorial interventions need to be carried out to guide the development of more adequate interventions.

Specific to Mexico-Born MA, early intervention needs to be carried out to promote the retention and further development of healthy dietary characteristics, as well as the prevention of those negative. Additionally, early childhood and adolescent education is essential to improving the dietary patterns and health of this population. Lastly, education not only needs to focus on healthy dietary patterns, but also eating healthy on a budget, social support, as well as available community, state, and federal resources. Further research is warranted that examines the efficacy of early intervention following immigration on nutrition-related outcomes, as well as the efficacy of these strategies in acculturated first-generation immigrants and MA native to the United States.

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Appendix.

## Table 1: HEI-2010 Scoring

| HEI-2010[1] Components & Scoring Standards | | | |
|---|---|---|---|
| **Component** | **Maximum points** | **Standard for maximum score** | **Standard for minimum score of zero** |
| **Adequacy:** | | | |
| Total Fruit[2] | 5 | ≥0.8 cup equiv. per 1,000 kcal | No Fruit |
| Whole Fruit[3] | 5 | ≥0.4 cup equiv. per 1,000 kcal | No Whole Fruit |
| Total Vegetables[4] | 5 | ≥1.1 cup equiv. per 1,000 kcal | No Vegetables |
| Greens and Beans[4] | 5 | ≥0.2 cup equiv. per 1,000 kcal | No Dark Green Vegetables or Beans and Peas |
| Whole Grains | 10 | ≥1.5 oz equiv. per 1,000 kcal | No Whole Grains |
| Dairy[5] | 10 | ≥1.3 cup equiv. per 1,000 kcal | No Dairy |
| Total Protein Foods[6] | 5 | ≥2.5 oz equiv. per 1,000 kcal | No Protein Foods |
| Seafood and Plant Proteins[6,7] | 5 | ≥0.8 oz equiv. per 1,000 kcal | No Seafood or Plant Proteins |
| Fatty Acids[8] | 10 | (PUFAs + MUFAs)/SFAs >2.5 | (PUFAs + MUFAs)/SFAs <1.2 |
| **Moderation:** | | | |
| Refined Grains | 10 | ≤1.8 oz equiv. per 1,000 kcal | ≥4.3 oz equiv. per 1,000 kcal |
| Sodium | 10 | ≤1.1 gram per 1,000 kcal | ≥2.0 grams per 1,000 kcal |
| Empty Calories[9] | 20 | ≤19% of energy | ≥50% of energy |

1: **Intakes between the minimum and maximum standards are scored proportionately**
2: Includes fruit juice.
3: Includes all forms except juice.
4: Includes any beans and peas not counted as Total Protein Foods.
5: Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.
6: Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met.
7: Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods.
8: Ratio of poly- and monounsaturated fatty acids to saturated fatty acids.
9: Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is >13 grams/1000 kcal.

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## Table 2: Energy and Nutrient Intakes By Origin

| | Total | | US-born Mexican American (n=) | | Mexican-born Mexican American (n=) | | |
|---|---|---|---|---|---|---|---|
| | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** | **P** |
| Energy (kcal) | 2172.5 | 24.1 | 2201.6 | 44.6 | 2151.4 | 31.2 | 0.393 |
| Protein (gm) | 85.9 | 1.2 | 84.8 | 1.6 | 86.6 | 1.5 | 0.404 |
| **Total fat (gm)** | 77.1 | 1.3 | 83.4 | 2.2 | 72.6 | 1.4 | <0.001 |
| Carbohydrate (gm) | 274.7 | 2.6 | 267.0 | 5.5 | 280.4 | 4.1 | 0.101 |
| Iron (mg) | 15.3 | 0.2 | 15.6 | 0.4 | 15.0 | 0.2 | 0.18 |
| Calcium (mg) | 940.1 | 15.1 | 937.7 | 25.3 | 941.9 | 16.4 | 0.884 |
| **Potassium (mg)** | 2685.2 | 41.2 | 2591.1 | 65.3 | 2753.8 | 45.8 | 0.029 |
| **Magnesium (mg)** | 310.1 | 4.8 | 295.0 | 7.9 | 321.1 | 4.8 | 0.003 |
| Vitamin A, RAE (mcg) | 508.1 | 13.1 | 509.4 | 17.8 | 507.1 | 16.6 | 0.921 |
| **Folate, DFE (mcg)** | 515.0 | 9.0 | 534.9 | 14.2 | 500.5 | 10.5 | 0.044 |
| Vitamin B6 (mg) | 2.1 | 0.0 | 2.0 | 0.1 | 2.1 | 0.1 | 0.26 |
| Vitamin B12 (mcg) | 5.2 | 0.1 | 5.4 | 0.3 | 5.0 | 0.2 | 0.321 |
| **Vitamin C (mg)** | 96.8 | 2.3 | 83.9 | 3.7 | 106.2 | 3.5 | <0.001 |
| kcal Alcohol | 61.6 | 4.8 | 67.8 | 6.0 | 57.1 | 5.3 | 0.085 |
| **kcal Solid Fat** | 338.6 | 7.2 | 369.1 | 12.1 | 316.3 | 8.3 | <0.001 |
| kcal Added Sugar | 376.0 | 6.2 | 396.2 | 12.5 | 361.3 | 9.9 | 0.07 |

*__Bold:__ p <0.05

## Table 3: Energy-Adjusted Nutrient Intakes By Origin

| | Total | | US born Mexican American (n=) | | Mexican-born Mexican American (n=) | | |
|---|---|---|---|---|---|---|---|
| **Energy-Adjusted nutrients** | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** | **P** |
| Protein (gm) | 40.08 | 0.29 | 39.47 | 0.48 | 40.52 | 0.39 | 0.1120 |
| **Total fat (gm)** | 34.79 | 0.29 | 37.19 | 0.48 | 33.04 | 0.36 | **<0.001** |
| **Carbohydrate (gm)** | 128.95 | 0.76 | 123.43 | 1.11 | 132.97 | 1.00 | **<0.001** |
| Iron (mg) | 7.31 | 0.08 | 7.51 | 0.15 | 7.16 | 0.09 | 0.0450 |
| Calcium (mg) | 452.51 | 6.62 | 448.51 | 9.89 | 455.42 | 7.05 | 0.5110 |
| **Potassium (mg)** | 1289.63 | 14.36 | 1240.54 | 23.81 | 1325.39 | 14.95 | 0.0020 |
| **Magnesium (mg)** | 148.82 | 1.60 | 141.16 | 2.31 | 154.41 | 1.47 | **<0.001** |
| Vitamin A, RAE (mcg) | 253.24 | 6.55 | 249.04 | 8.97 | 256.29 | 9.10 | 0.5660 |
| Folate, DFE (mcg) | 246.39 | 3.88 | 255.34 | 5.71 | 239.87 | 4.62 | 0.0270 |
| Vitamin B6 (mg) | 1.00 | 0.02 | 0.97 | 0.03 | 1.02 | 0.03 | 0.2610 |
| Vitamin B12 (mcg) | 2.43 | 0.06 | 2.45 | 0.09 | 2.42 | 0.10 | 0.8330 |
| **Vitamin C (mg)** | 48.54 | 1.20 | 43.16 | 2.11 | 52.46 | 1.78 | 0.0050 |

*__Bold:__ p <0.05

## Table 4: HEI-2010 Scores by Origin

| | Total | | US-born Mexican America (n=) | | Mexican-born Mexican American (n=) | | |
|---|---|---|---|---|---|---|---|
| **Healthy Eating Index 2010 Score** | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** | **P** |
| **Total Fruit HEI score** | 2.3 | 0.1 | 1.9 | 0.1 | 2.5 | 0.1 | <0.001 |
| **Whole Fruit HEI score** | 2.1 | 0.1 | 1.7 | 0.1 | 2.4 | 0.1 | <0.001 |
| Total Vegetables HEI score | 3.0 | 0.1 | 3.0 | 0.1 | 3.0 | 0.1 | 0.454 |
| **Greens and Beans HEI score** | 1.7 | 0.0 | 1.4 | 0.1 | 2.0 | 0.1 | <0.001 |
| **Whole Grains HEI score** | 1.5 | 0.1 | 1.9 | 0.1 | 1.2 | 0.1 | <0.001 |
| Dairy HEI score | 4.7 | 0.1 | 4.7 | 0.1 | 4.7 | 0.1 | 0.664 |
| Total Protein Foods HEI score | 4.3 | 0.0 | 4.2 | 0.0 | 4.4 | 0.0 | 0.05 |
| Seafood and Plant Proteins HEI score | 1.8 | 0.0 | 1.8 | 0.1 | 1.9 | 0.1 | 0.591 |
| Fatty Acids HEI score | 5.2 | 0.1 | 5.1 | 0.1 | 5.3 | 0.1 | 0.385 |
| **Refined Grains HEI score** | 4.3 | 0.1 | 5.2 | 0.2 | 3.5 | 0.1 | <0.001 |
| **Sodium HEI score** | 5.3 | 0.1 | 4.4 | 0.1 | 5.9 | 0.1 | <0.001 |
| **Empty Calories HEI score** | 10.6 | 0.2 | 9.9 | 0.2 | 11.2 | 0.2 | <0.001 |
| **Total 2010 HEI Score** | 46.9 | 0.4 | 45.4 | 0.6 | 48.0 | 0.6 | 0.001 |

*__Bold:__ p <0.05

## Table 5: Nutrient Intake vs. RDA

| Nutrient | Mexico-Born | US-Born | RDA | | | |
|---|---|---|---|---|---|---|
| **Magnesium** | 321.1 mg | 259.0 mg | *Males, 19-30*<br>400 mg | *Females, 19-30*<br>310 mg | *Males, 31+*<br>420 mg | *Females, 31+*<br>320 mg |
| **Vitamin A** | 507.1 mcg | 509.4 mcg | *Males, 19+*<br>900 mcg | *Females, 19+*<br>700 mcg | | |
| **Calcium** | 941.9 mg | 937.7 mg | *Males and Females, 19+*<br>1000 mg | | | |
| **Folate** | 500.5 mcg | 534.9 mcg | *Males and females, 19+*<br>400 mcg | *Pregnant*<br>600 mcg | | |

## Table 6: The Socio-Ecological Model

| | |
|---|---|
| Policy | -*Policies*, *Procedures*, and *Laws* in place to protect the community |
| Community | -*Mediating Structures*—Family, Informal Social Networks, Churches, Voluntary Associations, Neighbors<br><br>-*Organizational Relationships*—Competition and coordination between community organizations<br><br>-*Organizational Power*—The influence of organizations and individuals within the community |
| Organizational | -*Institutions*—Worksite/School Policies, State/Federal Health Departments, Healthcare Systems, Health Insurance, Minority Health Clinics<br><br>*Organizational Characteristics*- Properties of any organization that one is involved with, negative and positive: i.e. incentives, management/supervisor support, health-related rules and regulations |
| Interpersonal | -*Relationships*—Social support and peer pressures<br><br>-*Cultural Norms*-The acceptable patterns of behavior within a culture |
| Intrapersonal | -Knowledge, Attitudes, Beliefs, Behaviors, Self-Perception, Skills |

*Adapted from McLeroy et al.'s Ecological Perspective of Health Promotion Programs[13]